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Dynamics of Quadratic Gravity in Spherical Symmetry

Monday, 5 July 2021 18:10 (20 minutes)

We present the first numerically stable nonlinear evolution for the leading-order gravitational effective field theory (Quadratic Gravity) in the spherically-symmetric sector. The formulation relies on (i) harmonic gauge to cast the evolution system into quasi-linear form (ii) the Cartoon method to reduce to spherical symmetry in keeping with harmonic gauge, and (iii) order-reduction to 1st-order (in time) by means of introducing auxiliary variables. Well-posedness of the respective initial-value problem is numerically confirmed by evolving randomly perturbed flat-space and black-hole initial data. Our study serves as a proof-of-principle for the possibility of stable numerical evolution in the presence of higher derivatives. We also discuss physically (un)stable branches of black holes in quadratic gravity.

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